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# Mortality from Ischemic Heart Disease and Diabetes Mellitus (Type 2) in Four U.S. Wheat-Producing States: a Hypothesis Generating Study

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chlorophenoxy herbicides, clofibrate, coronary atherosclerosis, C-reactive protein, diabetes**,** ischemic heart disease, myocardial infarction.

**Abbreviations**

AMI, acute myocardial infarction;

CAS, coronary atherosclerosis;

CDC, Centers for Disease Control;

CI, 95% confidence interval;

C-RP, C-reactive protein;

2,4-D, 2,4-dichlorophenoxyacetic acid;

IARC, International Agency for Research on Cancer;

ICD9, International Classification of Diseases, 9th Revision;

MCPA, 4-chloro-2-methylphenoxyacetic acid;

MN, Minnesota;

MT, Montana;

NAS, National Academy of Sciences;

ND, North Dakota;

PPAR, peroxisome proliferator activated receptor;

RR, risk ratio;

SD, South Dakota;

SRR, standardized rate ratio;

2,3,7,8-TCDD, 2,3,7,8-tetrachlorodibenzo-para-dioxin;

USDA, U.S. Department of Agriculture;

USGS, U.S. Geologic Survey.

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## Abstract

This ecologic study examines ischemic heart disease and diabetes mortality in rural agricultural counties of Minnesota, Montana, North Dakota, and South Dakota, in association with environmental exposure to chlorophenoxy herbicides, using wheat acreage as a surrogate exposure. Data on agricultural land use and 1979-98 mortality were collected from the USDA and CDC websites, respectively. Counties were grouped based on percent land area dedicated to wheat farming. Poisson relative risks (RR) and 95% confidence intervals (CI), comparing high- and medium- to low-wheat counties, were obtained for ischemic heart disease, subcategories acute myocardial infarction (AMI) and coronary atherosclerosis (CAS), and diabetes, adjusting for sex, age, mortality cohort, and poverty index. Mortality from ischemic heart disease was modestly increased (RR=1.08; 95% CI, 1.04-1.12). Analyses of its two major forms were more revealing. In comparison to low-wheat counties, mortality in high-wheat counties from AMI was increased (RR=1.20; 95% CI, 1.14-1.26), and mortality from CAS was decreased (RR=0.89; 95% CI, 0.83-0.96). Mortality from AMI was more pronounced for those under age 65 (RR=1.31; 95%CI 1.22-1.39). Mortality from type 2 diabetes was increased (RR=1.16; 95% CI, 1.08-1.24). These results suggest that underlying cause of mortality from AMI and type 2 diabetes is increased, and underlying cause of mortality from CAS is decreased in counties where a large proportion of the land area is dedicated to spring and durum wheat farming. Firm conclusions on causal inference can not be reached until more definitive studies have been conducted.